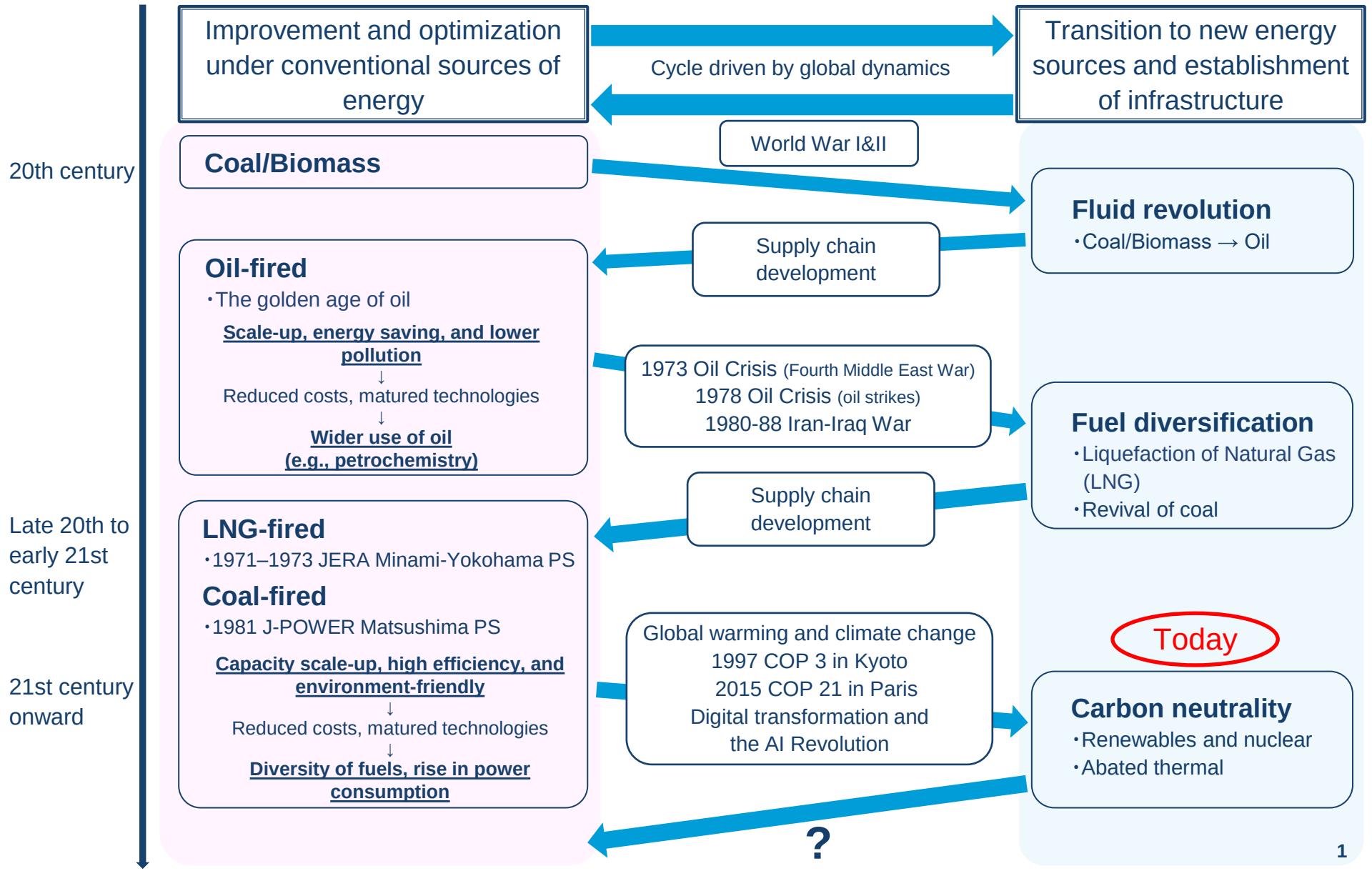
Special Lecture III at the 33rd
Clean Coal Day International Symposium (2024)

Towards Balancing Energy Security and the Environment

J-POWER BLUE MISSION 2050

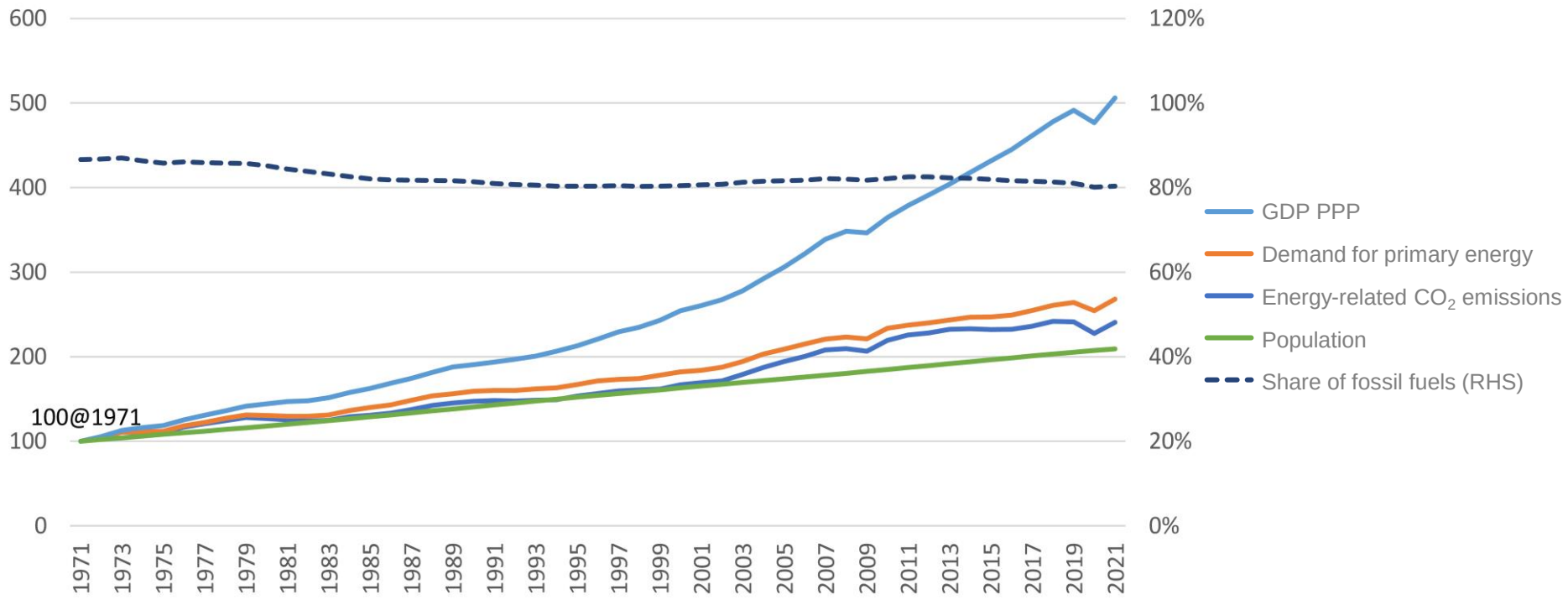
September 2, 2024
J-POWER

Energy Transition



GDP, Population, Energy Demand, CO_2 Emissions

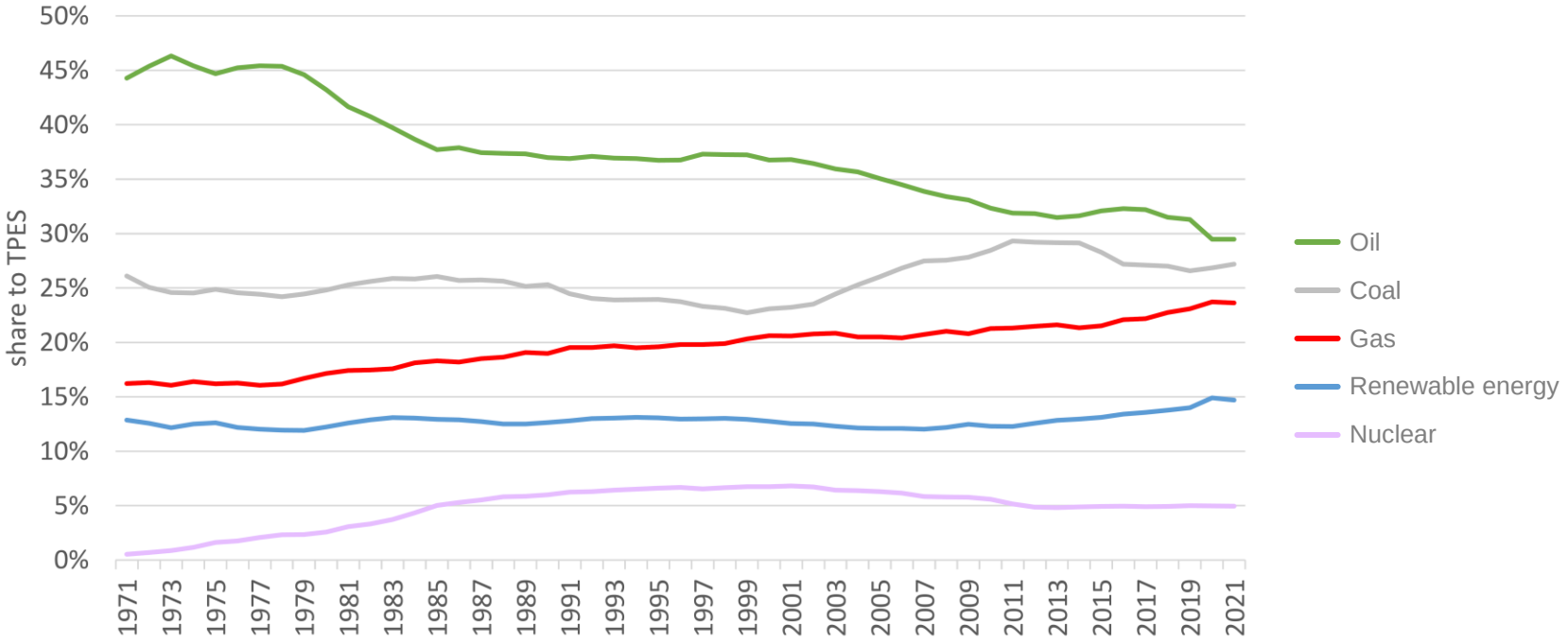
- Over the past 50 years and more
  - ・Even today, GDP, population, energy demand, and CO_2 emissions have all continued to increase globally.
  - ・The following figure indicates the order;
    Population < Energy-related CO_2 emissions < Demand for primary energy < GDP PPP.
  - ・The dashed line(black color) in the figure represents the “Share of fossil fuels” in the primary energy basket, which has never less than 80% in the past 50 years. == Decarbonization has no progressed in the past 50 years.



Source: The graph was created based on IEA World Energy Balance 2023.

Share of Primary Energy Supply by Source

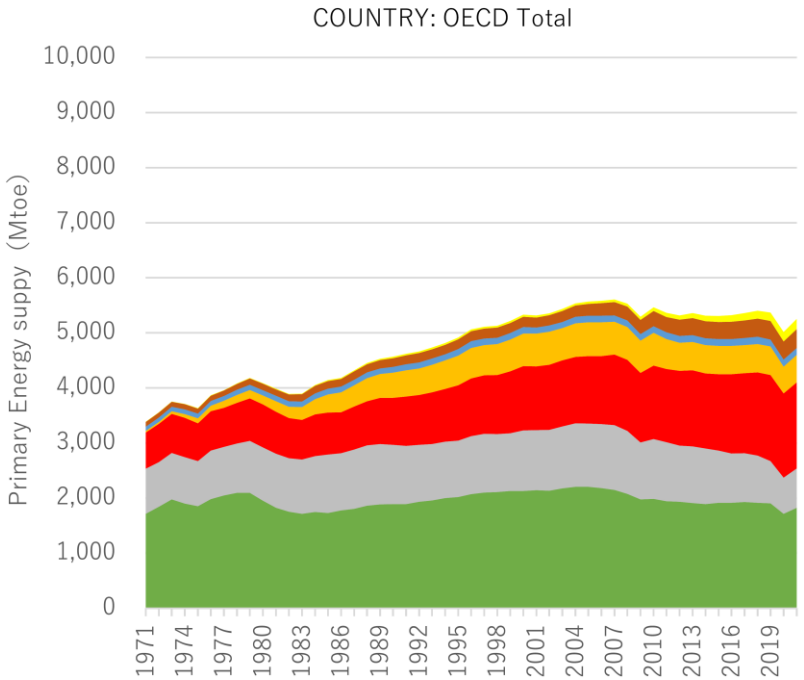
- Over the past 50 years and more, the descending order of share among sources has remained the same—namely, **oil at the top, followed by coal, gas, renewable energy, and nuclear energy.**
- Reasons may include economic efficiency, convenience, substitutability, and in addition to the lock-in effects of distribution infrastructure.

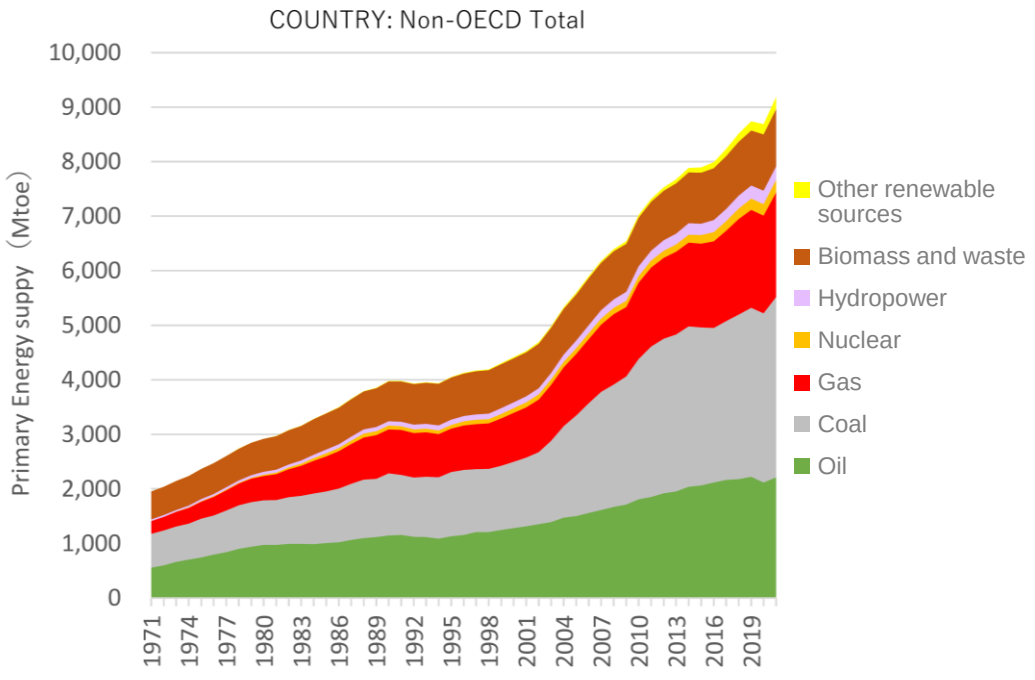


Source: The graph was created based on IEA World Energy Balance 2023.

Global Energy Demand by Source

- Primary energy demand in the OECD countries has been declining since the 2000s. Demand for coal has mainly declined.
- Primary energy demand of Non-OECD countries continues to increase and has risen sharply since the 2000s. All fuels are on the rise, especially coal.
- OECD countries have policy for decarbonization, advocating "eliminating the use of fossil fuels, especially coal," but for Non-OECD countries, this is an unrealistic proposition.

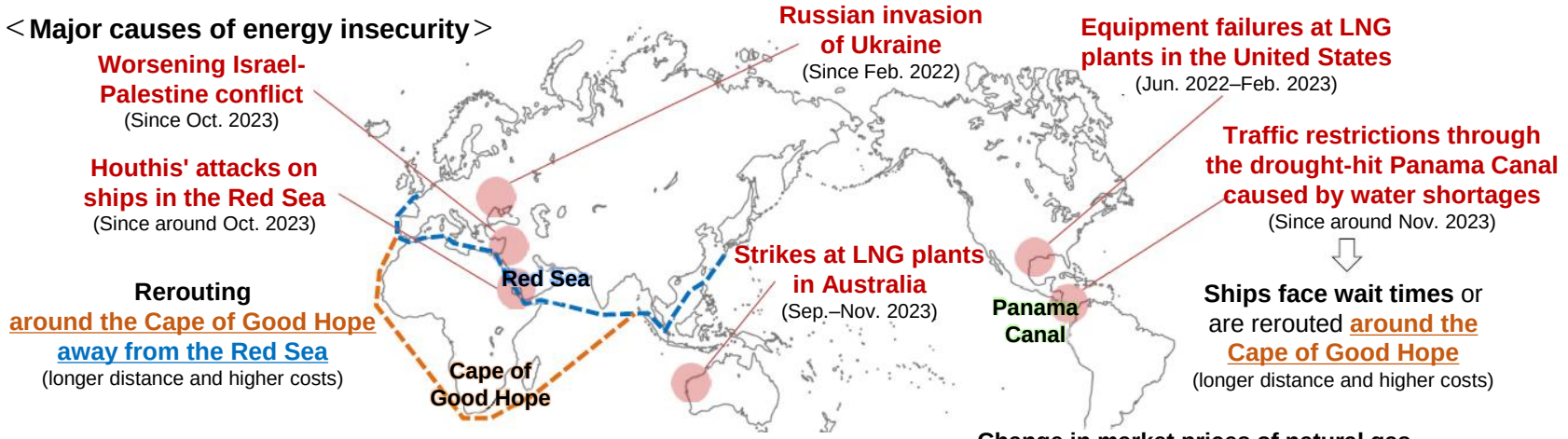


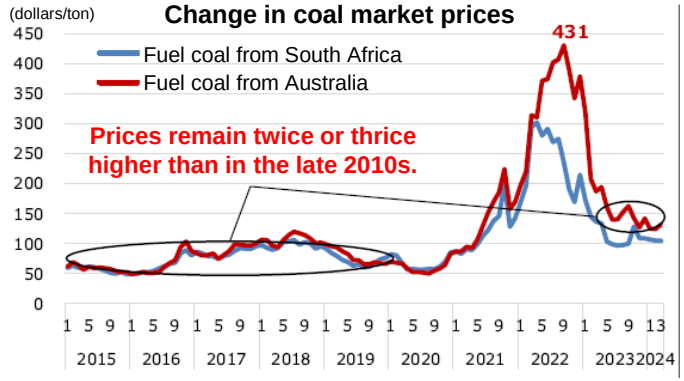


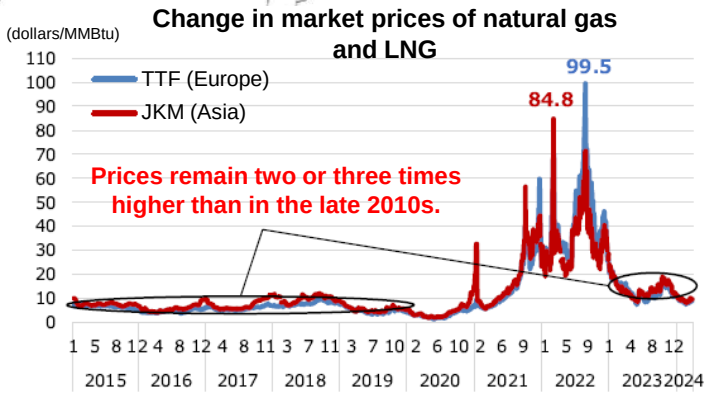
Source: The graph was created based on IEA World Energy Balance 2023.

Global Energy Dynamics and Fuel Prices

- Geopolitical risks related to fuel procurement are increasing due to factors such as Russian invasion of Ukraine, the worsening situation between Israel and Palestine, and conflicts or disasters in key maritime transportation routes like the Red Sea and the Panama Canal.
- Although fuel prices, which spiked in 2022, have since decreased, but their values remain about two to three times higher than in the late 2010s.
- Investment in upstream development of fossil fuels is declining and it is expected that fuel price volatility will increase in the future.





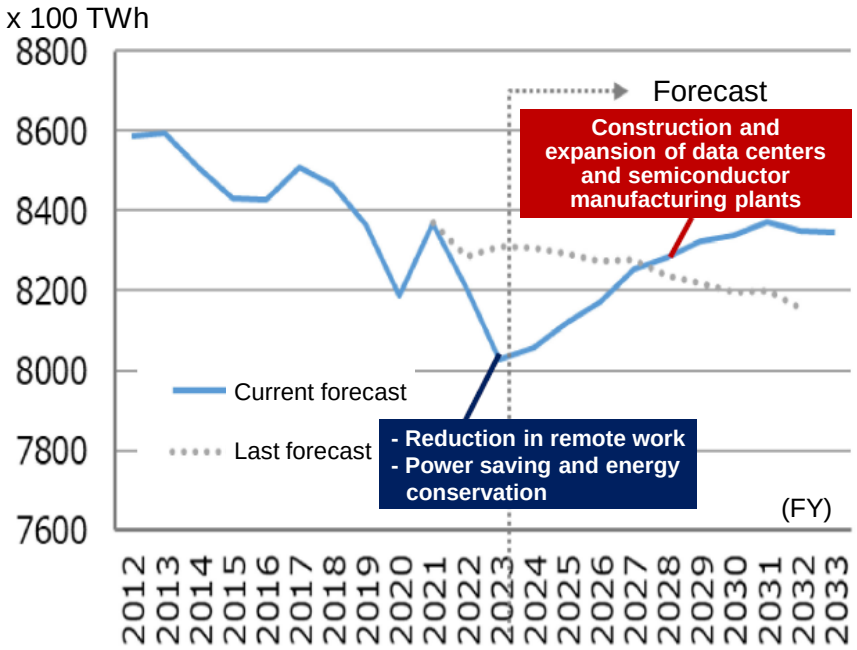


Source: Commentaries on Energy White Paper 2024 (June 2024)

Outlook for Power Demand in Japan with Ongoing Digital Transformation and the AI Revolution

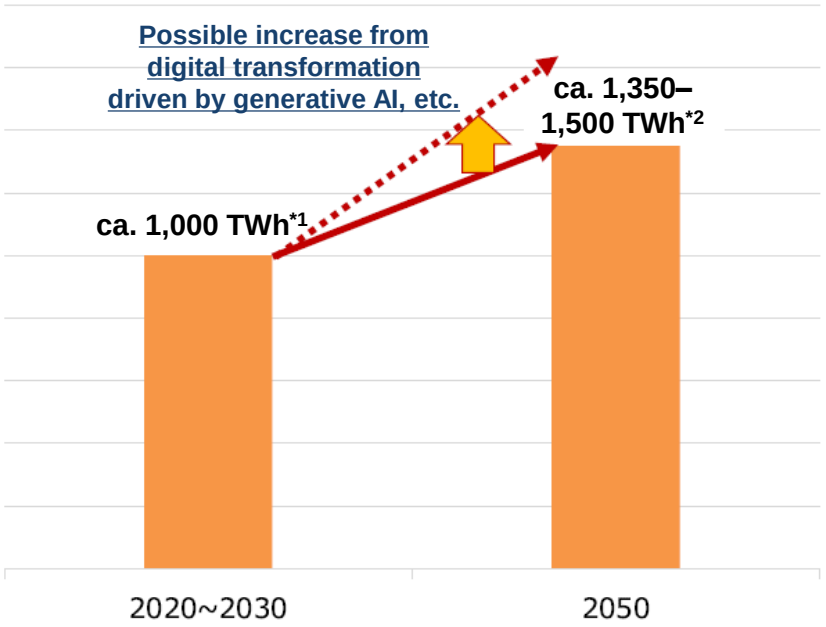
- According to a forecast by OCCTO for the next decade, household sector power demand will decrease due to population decline, power saving and energy conservation. In contrast, the industrial sector demand will significantly increase due to the construction and expansion of data centers and semiconductor factories (refer to left figure).
- In total, Japan's power demand is expected to increase 1.35 -1.5 times the current level by 2050 (refer to right figure).

Forecast power demand in Japan



*The graph was created based on Demand Forecast for Japan and by Serviced Region 2024 by the Organization for Cross-regional Coordination of Transmission Operators (OCCTO).

Forecast power generation in Japan



*1: The forecast is based on the Comprehensive Energy Statistics and Sixth Strategic Energy Plan.
*2: The reference value is based on power generation estimates by RITE presented at the 43rd meeting of the Strategic Policy Committee.

Source: Commentaries on Energy White Paper 2024 (June 2024)

J-POWER “BLUE MISSION 2050”

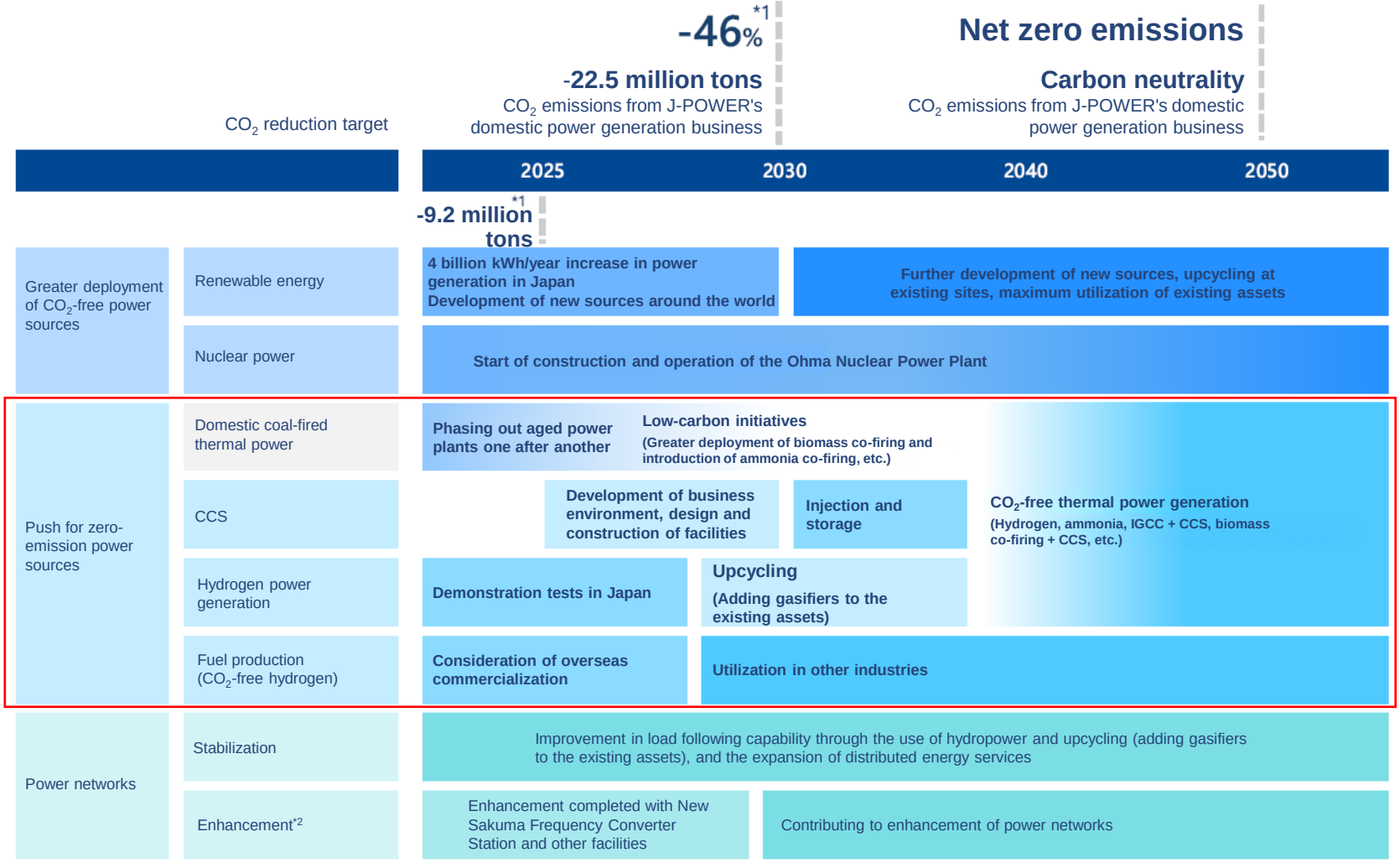
Realizing a Carbon-neutral and Hydrogen Society

J-POWER has defined the mission which will achieve Carbon-neutral by 2050 as “BLUE MISSION 2050”.

- J-POWER Group brings together a wealth of experience and technologies to reduce the CO_2 emissions caused by power generation to zero by 2050.
- The group has set a milestone to reduce CO_2 emissions by 46% in 2030.
- To fulfill this mission, J-POWER Group will contribute to the realization of a hydrogen-based society through the production of CO2-free hydrogen from coal.

Roadmap for Achieving Our Mission

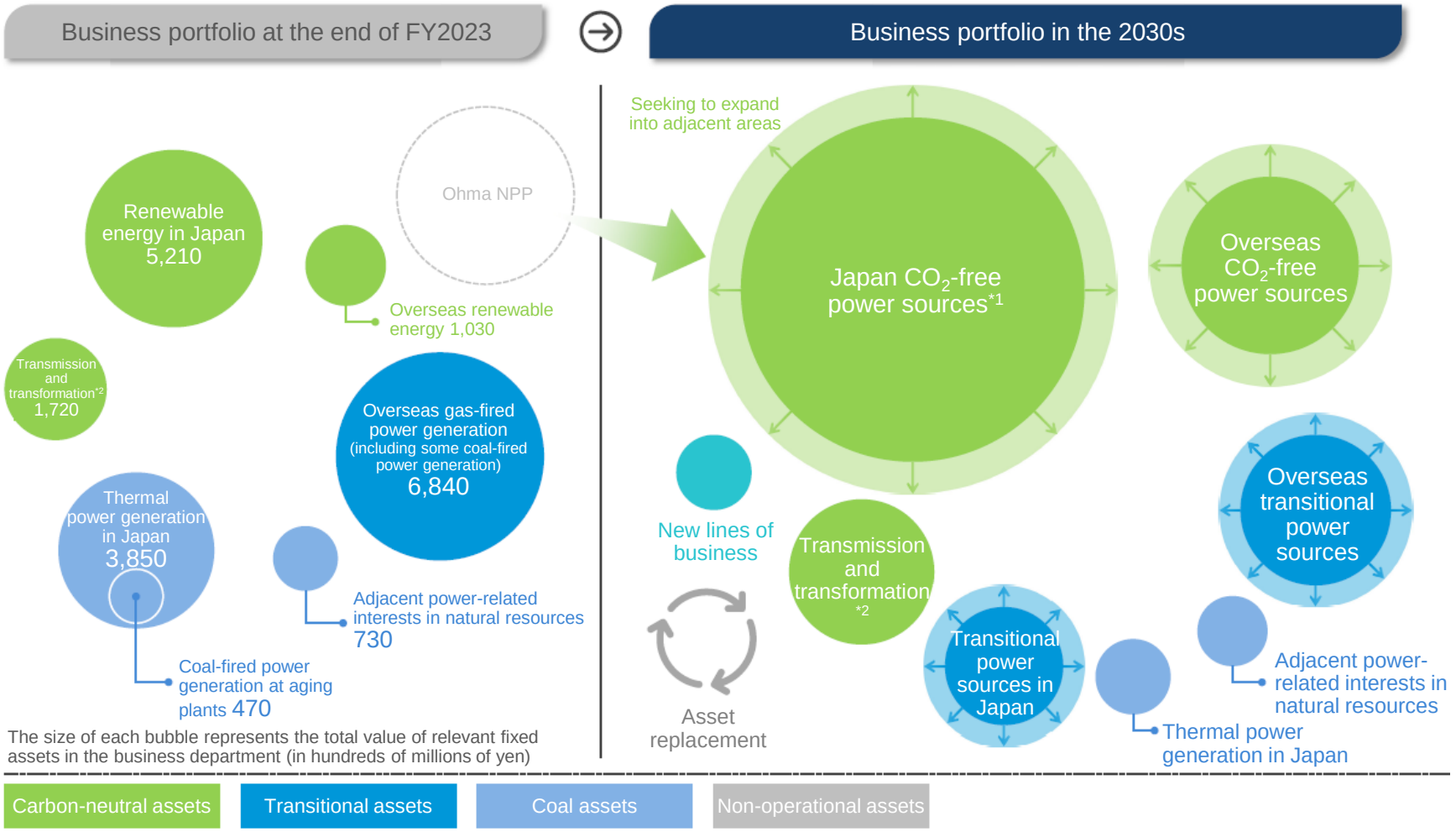
- J-POWER is on track to achieve its CO_2 emissions reduction target by 2030. The group will accelerate this with further initiatives with an eye to 2050.



*1 Compared to the actual emissions in FY2013. *2 The power network enhancement is an initiative of J-POWER Transmission Network.

Reshaping J-POWER's Business Portfolio In Line With J-POWER BLUE MISSION 2050

- J-POWER Group is steadily expanding its renewable energy businesses, developing the Ohma Nuclear Power Plant, and is pressing ahead with the necessary transition for thermal energy to reshape its portfolio to mainly base its business operations on carbon-neutral assets in the 2030s.

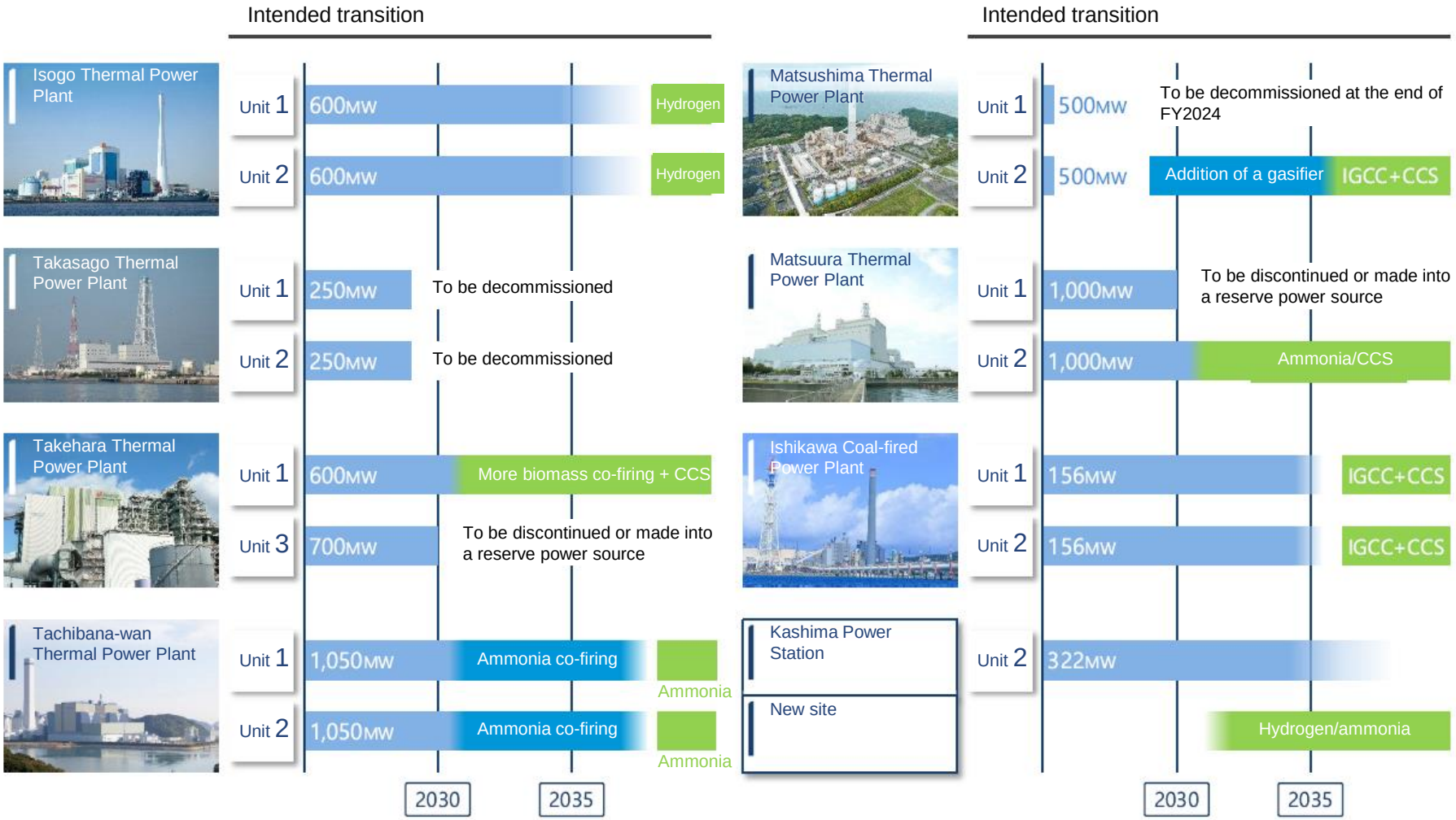


*1 Domestic renewable energy, CO_2-free thermal power, and Ohma NPP *2 Transmission and transformation business is an initiative of J-POWER Transmission.

Direction of Our Thermal Power Generation Transition in Japan

- A low-carbon or decarbonization is pursued by ensuring a reliable power supply with fading out inefficient coal-fired power plants by 2030 and choosing the right abated technologies applicable for highly efficient thermal power plants considering their site characteristics.

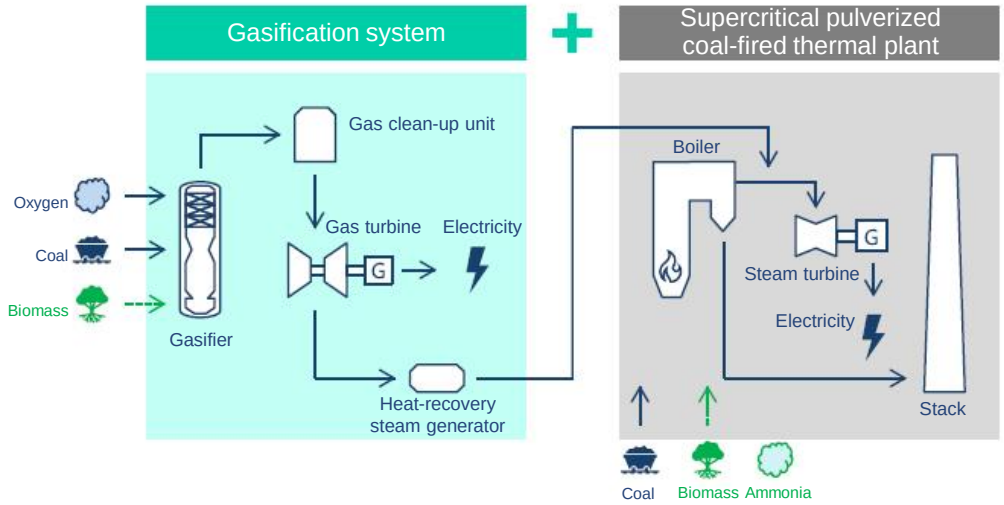
This plan will be updated, reviewed, and refined as needed according to the government's policies towards green transformation (including the energy master plan, global warming mitigation measures, and NDC), the balance of power supply and demand, the designed electricity system, the progress in industrial development, and other conditions.

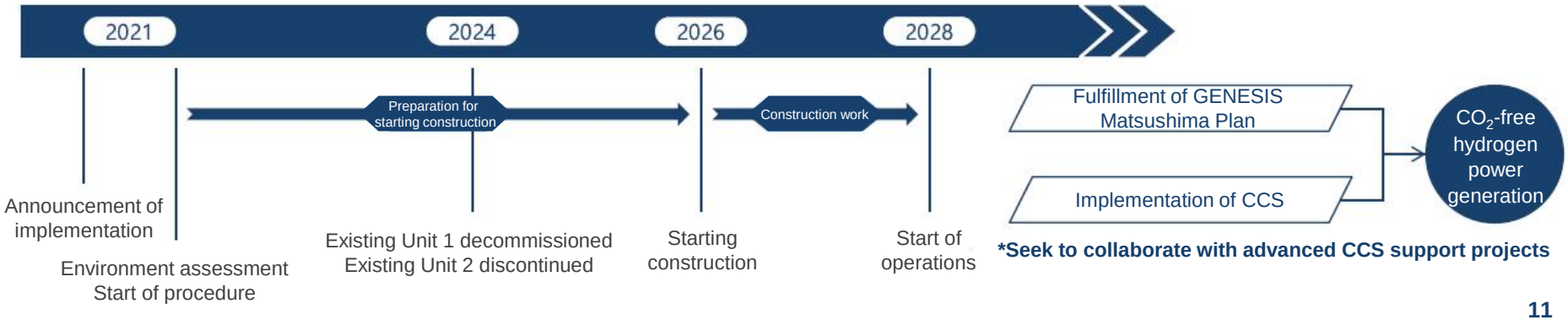


GENESIS Matsushima Plan

- Commercial application of the technology verified in the Osaki CoolGen Project combined with the upcycling of an existing unit with an additional gasification system
- As a first step toward power generation with CO_2-free hydrogen, the plant is aiming to be Japan's most advanced carbon-free thermal power plant.

First step toward CO_2-free hydrogen power generation

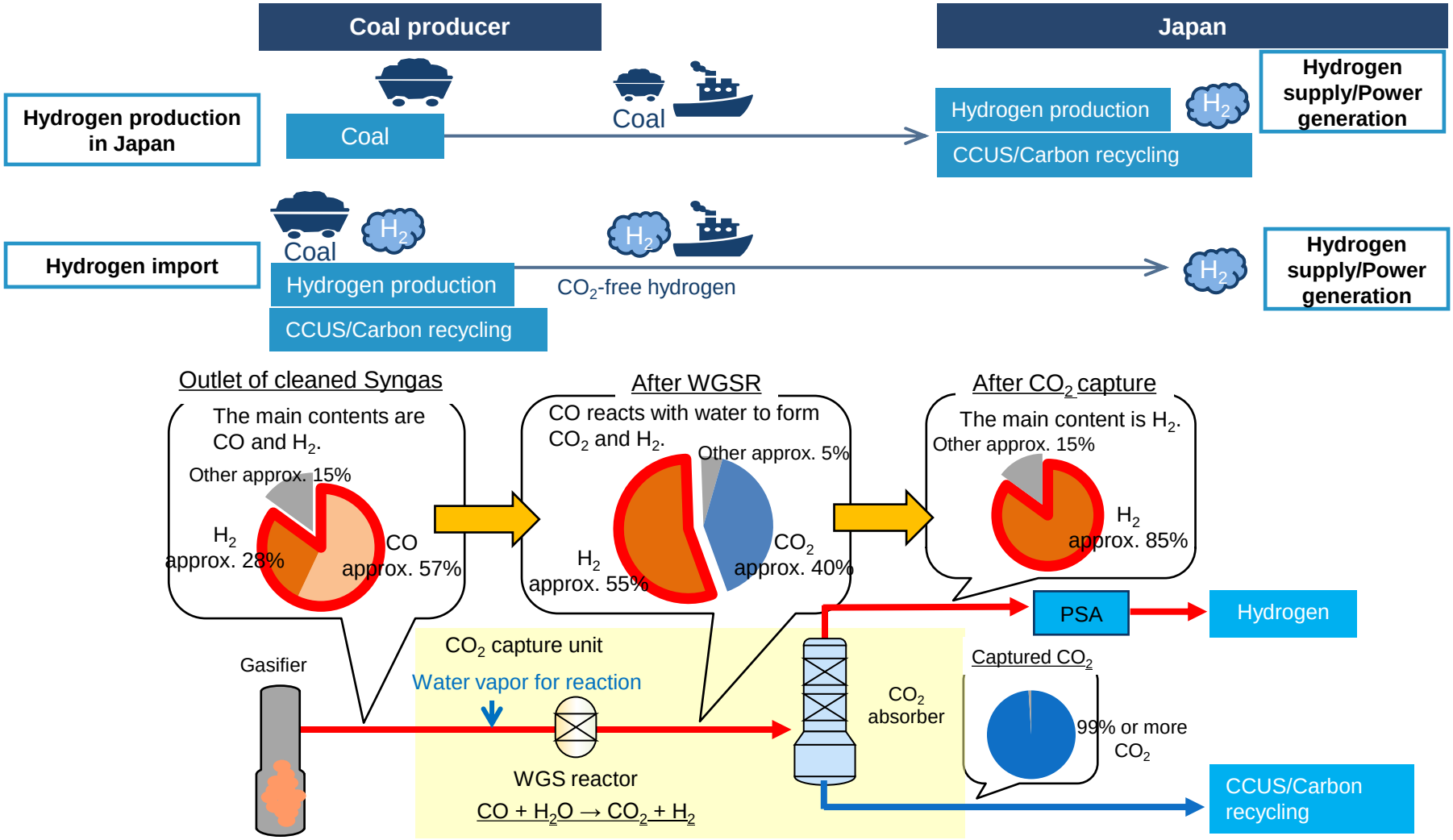




***Seek to collaborate with advanced CCS support projects**

Production of CO_2-Free Hydrogen From Coal and Core Technologies

- J-POWER will pursue economic efficiency and rationality, such as selection of suitable sites for CCS and transportation methods, with the goal of producing CO2-free hydrogen from coal both domestically and internationally.



Hydrogen production with technologies for oxygen-blown coal gasification and CO_2 capture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